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EU enlargement: Economic implications for countries and industries

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Preface

Enlargement to the East is probably the most important challenge for the European Union in the years to come. Although political considerations have been the main motivation for the enlargement, economic implications play a crucial role in the current debate on the timing and the terms of accession. Indeed, public support for EU enlargement depends to a large extent on the effects on income and consumption. This study sheds light on these effects by means of model simulations with CPB's WorldScan model. In particular, several aspects of EU enlargement are explored, including the move towards a customs union, the accession to the internal market, and free movement of labour.

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F.J.H. Don
Director of CPB

1 Introduction

This paper explores the economic consequences of the enlargement of the European Union (EU) with the Central and Eastern European Countries (CEECs). In contrast to most earlier analyses, we do not focus on existing formal trade barriers. The reason is that, by the end of 2002, these barriers will be removed entirely in accordance with the Europe agreements -- at least for industry products. Instead, we focus on further steps in the integration process which involve the accession to the internal market, the equalization of external tariffs and free movement of labour. Although these are not all the potential effects of the eastern enlargement, they capture some of its main economic dimensions. Other effects of enlargement, e.g. those associated with the subsequent accession to EMU, changes in the Common Agricultural Policy, and reforms of the Structural Funds are not explored here, in part because these effects are subject to considerable policy uncertainty.

While the implications of a common external tariff and the free movement of labour can be analysed in a straightforward manner, the analysis of accession to the internal market requires a more subtle approach. Previous studies have analysed this shock by means of an exogenous across-the-board reduction in trade costs (see e.g. Baldwin et al, 1997; Keuschnigg and Kohler, 1999ab; Breuss, 2001). Our analysis deviates from this approach in two ways. First of all, we take account of the sectoral variation in trade costs since enlargement of the internal market is likely to have disproportional effects on some industries.[1] Second, rather than simulating a "best-guess" reduction in trade costs, we estimate gravity equations to derive the size of the shock. More specifically, for 16 different industries, we derive the potential trade between the EU and the CEECs from gravity equations. The estimates provide an indication of trade flows when CEECs are a full member of the EU. Comparing this potential trade with actual trade, we can derive an estimate of the tariff equivalent of the barriers to trade. These barriers are then assumed to be removed when eastern countries accede to the EU.

This paper adopts a CGE model for the world economy, called WorldScan, to explore the implications of EU enlargement in its three dimensions. The model, calibrated on the most recent version of the GTAP database, has a number of features that make it appropriate for analysing the impact of enlargement. In particular, the model makes an explicit distinction between, on the one hand, six regions in the EU and, on the other hand, Poland, Hungary and the other accession countries. Moreover, the model distinguishes between 16 industries so that we are able to explore which industries will be most affected by EU-enlargement. Thus, combined with the gravity approach, the model does justice to the sectoral variation in the reduction in trade costs.

[1] Keuschnigg et al. (2001) also differentiate the reduction in trade costs between industries on the basis of non-tariff barriers reported by the OECD.

Our simulations suggest that EU enlargement yields large gains for the CEECs and a modest welfare improvement for the EU. This conclusion is consistent with previous model simulations of EU enlargement. For instance, Brown et al. (1997) estimate welfare gains for the CEECs between 3.8 and 7.3 per cent, and around 0.1 per cent for the EU. Baldwin et al. (1997) find a real income gain of 1.5 per cent for the CEECs and more modest effects for the EU. Breuss (2001) reports effects on real GDP between 4 and 9 per cent for the CEECs and about one tenth of that for the EU. Our findings tend to be somewhat larger than the effects reported in those previous studies. This is because of the relatively large shock associated with the accession to the internal market which, in contrast to the previous studies, is based on empirical research.

The rest of this paper is organised as follows. Section 2 discusses the main features of the WorldScan model. Section 3 demonstrates the shock of EU-enlargement in three dimensions: the shift towards a customs union, accession to the internal EU market and free movement of labour. Section 4 analyses the implication of these shocks for both the EU and accession countries. In section 5, we perform sensitivity analysis on the simulations. Finally, section 6 concludes.

2 The WorldScan model

WorldScan is a computable general equilibrium model for the world economy.[2] The model is calibrated on the basis of the GTAP database, version 5 (Purdue 2001) with 1997 as the base year. The database allows us to distinguish between a large number of regions and sectors. In particular, the EU is divided into six regions: Germany, France, UK, Netherlands, South EU (comprising Italy, Spain, Portugal and Greece) and Rest EU (comprising Austria, Belgium, Luxembourg, Ireland, Denmark, Sweden and Finland). The accession countries are divided into three regions: Poland, Hungary and CEEC5 (comprising Czech Republic, Slovak Republic, Slovenia, Bulgaria and Romania). Hence, the Baltic states (Estonia, Latvia and Lithuania) are not included in the analysis since the data neither distinguish these countries separately nor as a block.[3] The rest of the world economy is divided further into three other regions, namely, the former Soviet Union, rest OECD and rest of the world (ROW). For each region, we distinguish sixteen sectors. These consists of agriculture, raw materials, ten manufacturing sectors and four service sectors. As the model distinguishes only one aggregated agricultural sector, we are unable to explore the details of changes in the common agricultural policies of the EU. Appendix A provides more information on the country and sectoral details.

The heart of the model relies on neoclassical theories of growth and international trade. Sectoral production technologies are modelled as nested CES functions. At the lower nesting,

[2] See CPB (1999) for more details.

[3] In fact, the Baltic states are included in the data for the former Soviet Union.

two composite inputs are produced. On the one hand, value-added is produced by combining low-skilled labour, high-skilled labour, capital and, in some sectors, a fixed factor (land in the sector agriculture and natural resources in the sector raw materials). The production of value-added is modelled by means of a Cobb-douglas technology. On the other hand, various intermediate inputs are combined to yield a second composite input. Here, we use a CES function with a substitution elasticity of 0.8. In principle, there exist sixteen intermediate inputs. However, there are only a few intermediate inputs important in the production process for most industries. At the higher nesting, the two composite inputs, i.e. value-added and the composite of intermediate inputs, are combined in a CES technology to yield final output. The substitution elasticity between the two composite inputs is 0.4.

With respect to trade, WorldScan adopts an Armington specification, explaining two-way trade between regions and allowing market power of each region. The demand elasticity for manufacturing industries is set at 5.6. For services industries the elasticity is set at a lower level; for raw materials and agriculture at a higher level. In the long run, trade patterns are determined by Heckscher-Ohlin mechanisms, i.e. based on factor endowments. On the capital market, WorldScan assumes imperfect capital mobility across borders. In particular, the model includes a portfolio mechanism in which capital owners distribute their investments over regions, depending on the rates of return and the preferences for asset diversification. Consumption patterns may differ across countries and depend on per capita income. If welfare levels converge, these consumption patterns also converge towards a universal pattern. We assume that the labour markets for low-and high-skilled workers clear. In the baseline, labour does not migrate.

Table 2.1 Characteristics of the CEECs in 1997

	population in millions	GDP in billion US $	savings/GDP ratio	investment/GDP ratio
Hungary	10	42	0.21	0.24
Poland	39	123	0.10	0.23
CEEC5	49	131	0.16	0.23
EU-15	373	7914	0.19	0.19
CEEC7/EU-15	0.26	0.04		

Source: Purdue (2001)

Tables 2.1 - 2.4 provide some background information about the calibration of Worldscan, especially for the CEECs. Table 2.1 reveals that enlargement of the EU with 7 countries (referred to as the CEEC7) implies an increase in the EU population by around 26%, while GDP will rise only by a mere 4%. Table 2.1 reveals also that the investment/GDP ratio in the CEECs is higher than the saving/GDP ratio. This suggests that all CEECs experience a trade deficit in 1997 and that a substantial part of investment is financed by foreign capital.

The trade deficits are also observed in table 2.2, which presents the export and import shares of the CEECs. The table reveals that Hungary is relatively open, a feature that is common for smaller countries. The CEEC's trade patterns are primarily geared to the EU. Intra-CEEC trade is only marginal. Trade with the rest of the world mainly concerns the Rest OECD.

Table 2.2 Trade/GDP ratio, distinguished by region in 1997

	EU	ROW	CEEC7	Total
Export share				
- Hungary	0.34	0.16	0.04	0.54
- Poland	0.14	0.09	0.01	0.25
- CEEC5	0.26	0.15	0.02	0.44
Import share				
- Hungary	0.36	0.17	0.04	0.57
- Poland	0.24	0.12	0.02	0.38
- CEEC5	0.31	0.17	0.02	0.50

Source: Purdue (2001)

Table 2.3 shows the sectoral value-added shares for all sixteen sectors distinguished in WorldScan, both for the EU and the CEECs. It shows that agriculture, food processing and textiles contribute relatively more to GDP in the CEECs than in the EU. Electronic and transport equipment and other services contribute relatively little to GDP in these countries.

Table 2.3 Sectoral value added in % of total value added per region in 1997

	Hungary	Poland	CEEC5	EU
Agriculture	7.0	8.0	9.2	3.8
Raw materials	0.5	3.4	2.4	0.4
Food Processing	3.5	6.8	6.4	3.1
Textiles and Leather	2.2	1.9	5.0	1.3
Non-metalic Minerals	0.9	1.3	1.8	1.2
Energy-intensive products	4.3	3.1	4.4	3.2
Other manufacturing	1.9	4.5	5.0	3.5
Metals	0.6	1.3	2.7	0.9
Fabricated Metal Products	1.2	1.6	2.1	1.6
Machinery and Equipment	3.2	3.0	5.3	3.5
Electronic Equipment	1.4	0.5	0.5	1.9
Transport Equipment	1.5	0.9	1.9	2.2
Trade services	13.3	17.1	11.6	13.1
Transport&Communication	10.4	7.1	10.8	6.9
Financial Services	4.1	1.7	4.5	3.9
Other Services	44.1	37.8	26.3	49.3

Source: Purdue (2001)

Among the three CEEC regions, there exist remarkable differences in the sectoral structures. In Hungary agriculture, food processing, other manufacturing and metals are less important than in Poland and the CEEC5. These sectors are typically low-skilled labour intensive. Other services is relatively important in Hungarian value added. In the CEEC5, manufacturing contributes relatively much to GDP, especially textiles and other manufacturing. Services are less important, especially trade services and other services.

Table 2.4 presents the trade shares of the various sectors in terms of total trade of a country. This yields information about the export specialisation. We see that export of the CEECs is concentrated in four sectors: textiles, machinery and equipment, transport and other services. For textiles and machinery and equipment, these high export shares originate in a high share of export in terms of value-added of that sector. For instance, almost all output of textiles in Hungary is exported. The high export shares of transport and other services, in contrast, are due to the big size of these sectors in the economy.

Comparing the three CEEC regions, we find that Hungarian exports are specialised relatively more in agriculture, energy-intensive products and electronic equipment. Poland specialises relatively more in raw materials, other manufacturing, and trade services. The export share of the CEEC5 is relatively high in metals and transport.

Table 2.4 Sectoral export in % of total export in the CEECs in 1997

	Hungary	Poland	CEEC5
Agriculture	5.1	2.2	2.2
Raw materials	0.3	6.8	0.9
Food Processing	4.5	5.1	2.7
Textiles and Leather	10.1	9.2	10.2
Non-metalic Minerals	2.0	2.5	3.7
Energy-intensive products	8.3	5.5	6.8
Other manufacturing	3.4	10.8	8.1
Metals	1.5	5.5	6.4
Fabricated Metal Products	2.3	3.8	3.4
Machinery and Equipment	14.3	10.5	14.8
Electronic Equipment	6.4	1.8	1.0
Transport Equipment	6.3	2.5	5.7
Trade services	3.9	4.8	2.1
Transport&Communication	11.8	14.2	19.1
Financial Services	3.1	3.4	2.0
Other Services	16.6	11.6	10.9

Source: Purdue (2001)

In exploring the economic impact of EU-enlargement with WorldScan, we compare economic variables in 2020 with the results in a baseline scenario. In the baseline, GDP growth in CEEC7, the Former Soviet Union and ROW are based on long-term projections of the Worldbank

(2000). They have constructed projections until 2010 for all developing regions. We extrapolated these projections to 2020. Thus, economic growth in Hungary and Poland is set at 4.6% per year, which is a bit higher than in CEEC5 (4.3%) because the pace of reform in Bulgaria and Romania is relatively slow. For Western Europe and the rest of the OECD, GDP grows by about 2.1%, while in ROW it is nearly 5%, especially due to high growth in Asia and in particular China. In the baseline, there are no further agreements on global trade liberalization so that the degree of openness remains at a stable level in the scenario period.

3 Shock of enlargement

This section discusses three shocks of EU-enlargement: (i) a gradual removal of the remaining formal trade barriers in agriculture and food processing and the adoption of the common external tariff (CET), (ii) accession to the internal market, and (iii) free movement of labour. We do not analyse some other potential implications of enlargement such as accession to EMU, changes in the Common Agricultural Policies of the EU, or in EU policies with respect to the Structural Funds. Section 4 will analyse the economic implications of these shocks with the WorldScan model.

3.1 Towards a customs union

Accession of the CEECs to the EU implies a move from an almost free-trade area towards a customs union. This means that all remaining bilateral formal trade barriers will be abolished. In 1997, these barriers were present in both agriculture and several manufacturing sectors. In accordance with the Europe agreements, the bilateral tariffs for manufacturing products will have been removed by 2002. The abolishment of these tariffs can thus not be directly ascribed to accession to the EU. Therefore, we do not include the Europe agreements in our analysis (see appendix D). Instead, we focus on the bilateral tariffs that are not covered by the Europe agreements, namely those in agriculture and food processing.

Apart from abolishing bilateral trade barriers, the move towards a customs union means that the external tariffs in the CEECs with respect to third countries will be set equal to the common external tariff (CET)of the EU. This holds for both agriculuture and food processing and all manufacturing sectors.

Table 3.1 demonstrates the bilateral export and import tariffs in 1997 between the EU and the CEECs for agricultural products and food processing. It reveals that most regions provide export subsidies. Only Poland and the CEEC5 do not give export subsidies in agriculture. Hungary provides an export subsidy of 2.1% of the export value in agriculture and 1.7% in food processing. Compared to the CEECs, export subsidies of the EU are larger. The subsidy in agriculture is between 2.1% and 3% of the export value, while in food processing it is between

4.4% and 5.4%. Hence, the EU stimulates its exports of agricultural and food products more than the CEECs do.

Table 3.1 Formal bilateral and external tariffs in agriculture and food processing in the CEECs and the EU

	Export tariffs		Import tariffs		External import tariff	
	Agriculture	Food Processing	Agriculture	Food Processing	Agriculture	Food Processing
Levied by CEECs						
Hungary	–2.1	–1.7	22.7	35.6	15.9	32.0
Poland	0.0	–0.3	38.4	63.3	26.7	63.3
CEEC5	0.0	–3.5	24.6	41.0	17.6	48.9
Levied by EU-15					7.3	36.1
Hungary	–2.1	–5.2	17.3	33.2		
Poland	–3.0	–4.4	22.0	41.7		
CEEC5	–3.0	–5.4	9.4	30.4		

Source: Purdue (2001)

The third and fourth column of table 3.1 show the bilateral import tariffs in agriculture and food processing in 1997. We see that these tariffs are substantial, both in the CEECs and the EU. Compared to the EU, the import tariffs imposed by the CEECs are somewhat larger. Especially import tariffs in Poland are high while Hungarian tariffs are among the lowest. The EU levies the smallest tariffs on the CEEC5 and the highest on Polish products. These differences in EU tariffs may originate in both a different composition of agricultural export of the countries (since the underlying products in agriculture are taxed at different rates) and differentiation in tariffs.

Table 3.2 External tariffs in manufacturing in the CEECs and the EU in 1997

	Hungary	Poland	CEEC5	EU
Textiles and Leather	11.0	20.7	15.6	11.4
Non-metalic Minerals	7.5	10.9	11.2	4.7
Energy-intensive products	5.3	11.3	7.5	3.7
Other manufacturing	5.9	12.6	9.0	2.0
Metals	0.9	12.4	6.9	1.9
Fabricated Metal Products	10.1	14.3	8.2	2.7
Machinery and Equipment	8.9	12.5	7.6	2.8
Electronic Equipment	8.0	14.4	4.9	4.2
Transport Equipment	16.1	15.3	15.0	5.5

Source: Purdue (2001)

The last two columns in table 3.1 reveal the external tariffs in agriculture and food processing. For agricultural products, we see that the external tariff of the EU is lower than that of the accession countries. In food processing, the EU tariff is higher than in Hungary but lower than

in Poland and CEEC5. Among the accession countries, Hungary imposes the lowest external tariffs.

Table 3.2 demonstrates the external tariffs for manufacturing products. In general, the Hungarian external tariffs are relatively low, but still higher than the CET. The Polish external tariffs are the highest in most sectors.[4]

3.2 Accession to the internal market

The second component of EU enlargement involves the accession of the CEECs to the internal market. This will affect the economies of the CEECs and current EU members in several ways, e.g. via trade, FDI, domestic investment, etc. Our focus is on the trade effect.

Accession to the internal markt may increase trade for at least three reasons. First, a number of administrative barriers to trade will be eliminated or at least reduced to levels comparable to those between current EU members. Here, one can think of reduced costs of passing customs at the frontier: less time delays, less formalities etc. Second and probably more important is the reduction in technical barriers to trade. The Single Market reduces these technical barriers by means of mutual recognition of different technical regulations, minimum requirements and harmonisation of rules and regulations.[5] Finally, risk and uncertainty will be mitigated by the CEECs accession to the EU. One type of risk is the possibility that somewhere in the link from producer to consumer some agent defaults. This is especially important for goods moving from East to West as export credit guarantees are less well developed in the CEECs. Another is political risk, a risk more relevant for goods moving from West to East (as insurance does not cover these risks and as democracies are thought to be less stable in the CEECs). These risks and uncertainties may form substantial impediments to trade.[6]

In discussions about the EU internal market program of 1992, researchers had great difficulty in measuring the economic gains. The same holds true in assessing the enlargement of the internal market with new members. Today, however, we can observe how the internal market functions by comparing the trade intensity inside the EU with the trade intensity between two otherwise equivalent countries that are not part of the EU. We follow such a procedure to measure the economic consequences of accession to the internal market by estimating gravity equations on the industry level. The box discusses this methodology in more detail. More specifically, we follow Bergstrand (1989) in estimating the following equation:

[4] The external tariffs in raw materials and service sectors are negligible and therefore not reported.

[5] For a detailed discussion of these approaches and their effect on trade, see Brenton, et al. (2001).

[6] Conforming with the internal market acquis may also involve costs for CEEC producers, especially environmental norms and labour market regulation (safety and health). These costs are not included in the analysis. Part of these costs, however, may be compensated by the EU through the Structural Funds. Transfers and costs may thus cancel out.

$$X_{ijs} = \alpha_s Z_{ijs} + \beta_s D_{ijs}^{EU} \quad (1)$$

where X_{ijs} stands for the log of exports from country *i* to *j* in industry s. The vector Z_{ijs} contains several explanatory variables, including GDP (per capita) of the exporting and importing countries, the distance between the capitals of countries, a set of dummies, and the bilateral import and export tariffs between countries. The vector α_s contains the parameters we estimate for each sector. The variable D^{EU} is a dummy that equals unity if *i* and *j* are currently members of the EU and else zero. Details on the data, estimation and the results are given in appendix B.

The gravity model

Reminiscent to the law of gravity in physics, the gravity model suggests that the trade flow between two countries depends positively on their size and negatively on the distance between them. In economic terms, trade flows between two countries depend on the importer's demand and the exporters supply and on the cost of trade. The latter is proxied by distance and specific characteristics of the bilateral country relation, like sharing a language or having a common border. The importer's demand and exporter's supply is proxied by their outputs and per capita incomes.

The early contributions applying the gravity approach (e.g. Tinbergen, 1962), did not provide a theoretical motivation for the model. Nevertheless, the model evolved to becoming the workhorse model of empirical international trade. Helpman and Krugman (1985) show, however, that the basic gravity equation is simply derived from a trade model with differentiated goods. Deardorff (1998), moreover, demonstrates that the gravity equation is consistent with the Heckscher-Ohlin theory of international trade. This consistency of the gravity model with different trade models has increasesd the confidence in its use as a predictor for (potential) trade patterns.

Previous studies on the potential trade between CEECs and the current EU members largely restrict themselves to an economy-wide perspective. Without questioning the value of the insights delivered by the economy-wide perspective, it is evident - given the relative size of the CEECs to the current EU - that an industry-level analysis is required to shed light on potentially painful adjustment problems and promising opportunities.

The gravity model is rarely used on the industry level. Bergstrand (1989) is an exception. He derives a gravity equation for a multi-industry world that also allows for intra-industry trade. Using one-digit SITC industry level data of the 1960s and 1970s, his estimates yield plausible results.

Our main interest is in the estimated coefficient for the EU dummy, D^{EU}. For each of the 16 sectors this coefficient, β_s, is reported in the first column of table 3.3. It reveals that in ten out of sixteen industries, the dummy has a positive and significant coefficient. Hence, in these sectors, bilateral trade is systematically higher if two countries are both members of the EU. The dummies for agriculture and food processing are among the largest. Hence, the internal market and the common agricultural policy in the EU intensify intra-regional trade in these sectors. For textiles, we also find a high and significant dummy. The dummy for raw materials is negative, but insignificant. This may be due to oil being intensively traded between EU members and

non-members alike. For metals and machinery and equipment, we also find an insignificant EU dummy, while the same holds true in some service sectors. This suggests that, in these sectors, trade among EU members is not significantly more intense compared to two otherwise equivalent countries that are not both EU members. The insignificant dummies may either refer to industries where the internal market has not progressed much or where technical barriers to trade are unimportant.

Table 3.3 Trade increase and corresponding NTB per sector on the basis of EU-dummy

	EU-dummy	Trade increase	Non-tariff barrier
Agriculture	1.25[a]	249	17.7
Raw materials	–0.10	0	0.0
Food Processing	0.66[a]	94	11.7
Textiles and Leather	0.85[a]	134	14.5
Non-metalic Minerals	0.73[a]	107	13.1
Energy-intensive products	0.13	0	0.0
Other manufacturing	0.08	0	0.0
Metals	–0.10	0	0.0
Fabricated Metal Products	0.44[a]	56	8.0
Machinery and Equipment	0.31[a]	37	5.6
Electronic Equipment	0.58[a]	79	10.0
Transport Equipment	0.66[a]	94	11.4
Trade services	0.76[a]	113	17.2
Transport&Communication	0.03	0	0.0
Financial Services	–0.14	0	0.0
Other Services	0.27[a]	31	6.5

An [a] means that the coefficient is significant at the 5% level.

How to interpret these numbers? For industries with an insignificant dummy, we assume that accession to the internal market has no impact on trade (section 5 performs sensitivity analysis with respect to this assumption). For other sectors, the dummy is used to calculate the potential trade increase. In particular, we assume that EU membership implies that the dummy would change from zero to one for bilateral trade patterns between an EU and the CEECs. Thus, potential trade can be calculated as $\exp(\beta_s)$, where β_s denotes the estimated coefficient for the EU dummy in (1).[7] To illustrate, the coefficient for the EU dummy in food processing is equal to 0.66 so that the potential trade is $\exp(0.66) \approx 1.94$, i.e. almost twice the actual trade between CEECs and EU members. The potential trade increase is therefore 94%. The second column of table 3.3 reports the potential trade increases for all sectors.

[7] Bilateral exports will become $\exp(\beta_s)$ times the initial exports if accession countries become an EU member (i.e. if D^{EU} becomes 1). From this, we subtract $\exp(0)=1$ to arrive at the potential trade increase.

After having determined the potential trade increase per sector, the next step is to translate this into non-tariff barriers. To that end, we follow a calibration procedure that differs from the standard procedure to calibrate the model. Appendix C reports this procedure in detail. In short, to model the estimated implicit barriers, we translate the potential trade increases into a Samuelsonian iceberg trade-cost equivalent of the barriers (further non-tariff barriers: NTBs). If we abolish the NTBs in the model, we arrive at the (ex-ante) trade levels that correspond to the predictions from the gravity model. The final column of table 3.3 presents the value of these NTBs. These can be interpreted as the trade costs associated with non-membership of the internal market.

Table 3.4 Increase in total export per county on the basis of EU-dummy

	Total export	Bilateral export with EU/CEEC7
Hungary	44	65
Poland	30	50
CEEC5	32	52
EU15	2	51

Source: own calculations on the basis of table 3.3

The potential trade increase per sector can be used to calculate the aggregate trade increase per country. To that end, we multiply the existing trade shares of the corresponding sectors with the potential trade increases, reported in the second column of table 3.3. The results are reported in table 3.4. We see that exports increase most substantially for Hungary, namely by almost 44%. Bilateral trade with the EU even rises by 65%. For Poland and CEEC5, these figures are somewhat smaller. Total exports rise by approximately 30% and 32%, respectively, and bilateral trade by 50% and 52%. This difference is mainly because Hungarian export is relatively more specialized in industries with a large EU-dummy such as agriculture, textiles, machinery, electronic and transport equipment and other services (see table 2.4). The aggregate trade increase for EU countries is only 2%, which is much smaller than for the CEECs. This is because only a small fraction of the total trade of the EU countries is geared to the CEECs.[8]

The aggregate trade increases of table 3.4 are more or less consistent with other findings in the literature. For instance, the more recent aggregate gravity equations report an increase in bilateral trade on account of the EU dummy in the order of 30% to 60% (Brenton and Gros, 1997; Fidrmuc and Fidrmuc, 2001). Similarly, the results by Baldwin et al. (1997) suggest an aggregate increase in bilateral trade of around 30%. Studies that do not explicitly refer to the EU report even higher estimates. For instance, McCallum (1995) and Helliwell (1996) suggest that a

[8] There are two ways to calculate this number, namely, relative to the initial level of trade inclusive or exclusive of intra-EU trade. The 2% refers to the increase inclusive of intra-EU trade. If we would use the trade data exclusive of intra-EU trade, we would arrive at a trade increase of approximately 5%.

typical Canadian province trades 22 times more with another Canadian province than with a comparable neighbouring US state. This implies that borders matter substantially. As to another illustration outside the context of the EU enlargement, Frankel and Rose (2000) find that joining a free trade area triples(!) trade and that joining a currency union triples trade once more! This would imply that our estimates provide a lower bound on the trade effects of enlargement, especially if one believes that EMU will be the next step for the CEECs after accession to the EU.

3.3 Free movement of labour

Regarding the impact of EU-enlargement on migration, we rely on a study conducted by Boeri et al. (2000). They use historical immigration figures for Germany to estimate migration as a function of wage differentials, employment differentials and a set of dummy variables. By substituting current wages, employment levels and assuming free movement of labour from the first day of accession, the authors compute the likely implications of EU-enlargement on German immigration from the CEECs. These figures are then extrapolated to the other EU-countries on the basis of historical migration patterns between the CEECs and respective EU countries.

Assuming accession in 2002 for the ten candidate member states, Boeri et al. predict an inflow of 335.000 immigrants in the first year after accession towards the EU. This flow gradually declines in subsequent years. In 2030, the stock of migrants in the current EU countries will have grown to 4 million, which is approximately 4% of the total population in the CEECs.

Table 3.5 Migration effect by source and destination in 2020 (in 1000 Persons and in % of population)

	In 1000 persons	In % of the population
CEEC7	−2400	−2.3
- Hungary	−750	−2.0
- Poland	−150	−2.0
- CEEC5	−1500	−3.5
EU15	2400	0.6
- Germany	1575	2
- France	60	0.1
- United Kingdom	100	0.2
- Netherlands	25	0.2
- South Europe	180	0.2
- Rest EU	460	1.2

Source: Boeri et al. (2000) and own calculations

A nice feature of the study by Boeri et al. is that it gives an indication of the origin and destination of migrants. For instance, it suggests that 30% of all migrants originate from Poland, 7.5% from Hungary and the other part from the other accession countries. These shares depend not only on the size of countries, but also on the incentives for migration, determined by wage levels and employment rates. As the income gaps of Poland and Hungary with the EU are smaller than for the CEEC5, migration shares are somewhat lower for Hungary and Poland than their population sizes might suggest at first glance. From the migrants of the CEECs, 65% will move to Germany, 2,5% to France, 4% to the UK, 1% to the Netherlands, 7,5% to Southern Europe and 20% to the rest of Europe. Of this latter group, approximately 12% of the immigrants will go to Austria.

We used the figures reported by Boeri et al. in constructing our own migration experiment. In particular, we simulate the implications of an exogenous migration impulse with WorldScan in the next section. Hence, we do not take into account endogenous feedback effects on migration, e.g. due to wage convergence or changes in regional unemployment. Our impulse in Worldscan differs from the migration flows reported by Boeri et al. in two important ways. First, we assume accession in 2004 for Poland and Hungary and 2007 for the other CEECs. We therefore adjust the aggregate figures derived by Boeri et al. according to our differentiated accession pattern. Secondly, we evaluate the implications for migration in the year 2020 whereas the estimates by Boeri et al. suggest that migration will continue until 2030. Hence, we do not capture the entire migration impulse reported in their study. In this way, we arrive at a total stock of immigrants in the EU of 2.4 million in 2020 (see table 3.5).[9]

4 Economic impact of enlargement

This section explores the economic implications of the three shocks discussed in the previous section by running simulations with the WorldScan model. For all three experiments, we consider the macroeconomic implications, namely the effects on real GDP, the volume of private consumption, and the terms of trade. The effect on private consumption is closely related to real disposable income of private households and, therefore, best reflects the welfare effects of enlargement. The effect on consumption may differ from the implications for real GDP because of terms-of-trade effects, changes in wealth, and changes in saving behaviour. For the first two simulations, i.e. the customs union and the internal market, we also analyse the sectoral implications by looking at the relative changes in production in 16 different industries.

To put the effects of these three shocks into perspective, we also ran a simulation of the Europe agreements, i.e. the removal of formal bilateral trade barriers in manufacturing between

[9] This figure is close to the consensus estimate reported by Bauer and Zimmerman (2000).On the basis of a literature review and some own calculations, these authors estimate the migration effect of EU enlargement at around 3 million people after 15 years.

1997 and 2002. The outcomes are presented in appendix D. They suggest that the Europe agreements exert a positive effect on GDP of, on average, 2.6% in the CEECs and 0.1% in the EU. These figures can serve as a benchmark to compare the impact of a customs union, the internal market and free movement of labour.

In the experiments below, we assume that Poland and Hungary enter the EU in 2004 and the CEEC5 in 2007. All shocks are implemented gradually. The effects are evaluated in the year 2020, in which a new stable equilibrium is achieved.

4.1 Towards a customs union

In the first experiment, we simulate the implications of the elimination of bilateral tariffs reported in table 3.1, and the adoption of the CET by the CEECs. To understand the macroeconomic implications of this move towards a customs union, we first discuss the channels through which it affects the economies in WorldScan. In particular, the abolishment of formal trade barriers has two effects. First, it affects relative prices of intermediate inputs and final goods. This changes the demand for different goods from different origins, leading to trade creation and trade diversion. In particular, without import tariffs and export subsidies in agriculture and food processing, prices will better reflect relative scarcities so that countries can better exploit the gains from trade. Trade creation will cause a reallocation in production in all countries, resulting in efficiency improvements and an associated expansion in output. The increase in bilateral trade may also come at the expense of trade with third countries, which is referred to as trade diversion.

The second implication of abolishing formal trade barriers is that it affects the terms of trade, i.e. the price of exports relative to the price of imports. In particular, the abolishment of export subsidies will reduce supply of those products and, therefore, raise producer prices. This causes a terms-of-trade gain for the country that abolishes its export subsidy and a terms-of-trade loss for other countries. In contrast, abolishing import tariffs will improve the terms of trade for countries that export their goods to that market, but involves a terms-of-trade loss for the country that abolishes its own tariff. Although an improvement in the terms-of-trade may have adverse effects on production of a country, it can improve welfare since it raises the value of its produced goods, relative to imported goods. This welfare gain will be reflected in a higher volume of consumption.

Trade creation and terms-of-trade improvements may also raise the rate of return to capital. This will encourage savings, raise the inflow of foreign direct investment and thus boosts capital formation. This may further raise production. Moreover, changes in the external tariffs in manufacturing can affect the price of investment goods (fabricated metal products, machinery and equipment, electronic and transport equipment and construction delivered by other

services). This can increase the incentive to invest since the cost of capital declines. Especially the CEECs import a substantial amount of investment goods for which prices will fall.

Table 4.1 Macroeconomic effects of removing bilateral tariffs and the adoption of the CET by the CEECs

	volume of GDP (%)	volume of consumption (%)	terms of trade (%)
CEEC7	2.5	2.3	–0.3
- Hungary	1.9	2.6	1.1
- Poland	4.3	3.6	–0.9
- CEEC5	1.0	0.9	–0.3
EU15	0.0	0.0	0.0
- Germany	0.0	0.0	0.0
- France	–0.2	–0.2	0.0
- United Kingdom	0.0	0.1	0.1
- Netherlands	0.0	0.1	0.1
- South Europe	0.0	0.0	0.0
- Rest EU	0.0	0.0	0.0
Third countries	0.0	0.0	0.0
- Rest OECD	0.0	0.0	0.1
- Former Sovjet Union	0.0	0.0	0.1
- ROW	0.0	0.0	–0.1

Source: Worldscan

Macroeconomic effects

Table 4.1 shows the macroeconomic effects of a customs union. Overall, we find that the CEEC7 experiences an increase in GDP and consumption of 2.5% and 2.3%, respectively. Consumption and GDP in the EU hardly change, while third countries benefit slightly (although this is not visible in the figures). Compared to the effects of the Europe agreements (see appendix D), the effects of a customs union are of similar size.

Behind these aggregate figures, there are some important differences among countries. The third column of table 4.1 reveals that Poland and CEEC5 experience a terms-of-trade loss. This is due to the abolishment of export subsidies by the EU, and the relatively large reduction in external tariffs by Poland and CEEC5. The terms-of-trade losses explain that the change in GDP exceeds that in consumption. However, the abolishment of the large initial price distortions in Poland render the Polish efficiency gains of trade creation also relatively large. Furthermore, the lower investment prices induce extra capital accumulation. Accordingly, the GDP effect in Poland is relatively large

In contrast to Poland and CEEC5, Hungary experiences a terms-of-trade gain. The reason is that both current import tariffs of Hungary vis a vis the EU and its external tariffs are lower than for Poland and CEEC5 (see tables 3.1 and 3.2). The Hungarian external tariffs are sometimes even lower than the CET of the EU (in agriculture, food processing and metals) so that accession to the EU involves an actual increase in the Hungarian external tariff. The terms of trade

improvement for Hungary, together with the positive effects of trade creation, are responsible for an increase in consumption and GDP by, respectively 2.6% and 1.9%. These effects are smaller than for Poland. This is partly because the initial bilateral tariffs between the EU and Hungary are lower (so that less efficiency improvements can be reaped) and because the price of investment goods in Hungary falls less than in Poland.

The macroeconomic effects for EU countries are relatively small. The small decline in GDP (not visible in the figures) is due to lower export subsidies that reduce the export of agricultural and food products from the EU. Lower export subsidies, however, are also responsible for a terms-of-trade gain for the EU. Consequently, consumption does not decline. Hence, the gains for the accession countries are accompanied by negligible welfare effects for the EU.

Sectoral effects

Although the macroeconomic effects of a customs union are modest, the implications are more significant for particular industries. Table 4.2 presents the relative changes in output for 16 industries due to the move towards a customs union.

We see that the largest changes occur in agriculture and food processing.[10] This is because tariffs change most in these sectors. In Poland, a substantially lower external tariff in agriculture makes imports from third countries cheaper. Consequently, we observe a shift out of agricultural production in Poland. This does not hold for Hungary that already adopts lower import tariffs. Indeed, for Hungary, the positive effect of better accession to the EU market dominates the effect of cheaper imports from third countries. The external tariff in the food processing sector also declines. Despite the cheaper imports, however, production in this sector does not fall but rise in the CEECs. The reason is twofold. First, lower tariffs in agriculture reduce the cost of an important intermediary input for food processing. This makes the food processing industry more competitive. Second, the removal of bilateral tariffs with the EU boosts export towards the EU. These two effects dominate the fall in tariff protection against producers from third countries and producers from the EU. As a result, the food processing sector expands in all CEECs.

The external tariffs in the CEECs decline in all manufacturing sectors. The lower price of imported products exert a small negative effect on the production of these sectors in the CEECs. Moreover, the production effect in manufacturing also reflects a shift of labour and capital inputs towards food processing and, in case of Hungary, agriculture. Since the expansion of the agriculture and food processing sectors in Hungary is largest, we also observe the largest decline in manufacturing production in this country.

[10] Note that our high level of aggregation of the agriculture and food processing sectors does not do justice to the underlying differences in product categories. Stolwijk (2000) concludes on the basis of a scenario study for the Netherlands that the CEECs are likely to gain in sectors that are abundant in land and labour while the enlargement offers opportunities for the Dutch skill-intensive industries in food processing.

In the EU countries, the sectoral implications are much smaller than in the CEECs. The abolishment of export subsidies in agriculture and food processing, together with the lower external tariffs in the CEECs tend to reduce the EU export to the CEECs. Indeed, EU production in food processing declines in all EU countries. In agriculture, only production in the Netherlands expands. In most manufacturing sectors in the Southern EU countries and in the Netherlands, production drops slightly. In Germany, manufacturing sectors expand.

Table 4.2 Sectoral effects (relative changes in production) of removing tariffs and the adoption of the CET

	Hungary	Poland	CEEC5	Germany	Netherlands	South EU
Agriculture	15.7	–0.4	0.9	–0.0	2.0	–0.4
Raw materials	–4.4	–2.0	–0.1	0.2	–0.1	–0.1
Food Processing	56.2	29.9	10.6	–1.8	–1.2	–0.9
Textiles and Leather	–7.8	–1.2	0.7	–0.4	–0.5	–0.2
Non-metalic Minerals	-4.1	–0.5	–0.5	0.2	–0.3	–0.1
Energy-intensive products	–2.0	–0.8	–0.1	0.2	–0.2	–0.1
Other manufacturing	–4.6	1.8	–0.6	0.0	–0.3	–0.1
Metals	–3.7	–3.0	–1.0	0.2	–0.3	–0.1
Fabricated Metal Products	–6.8	–1.7	–0.7	0.1	–0.2	–0.0
Machinery and Equipment	–3.5	–1.4	–0.7	0.2	–0.2	–0.1
Electronic Equipment	–0.9	–0.7	0.4	0.1	–0.3	–0.0
Transport Equipment	–1.8	0.5	–0.3	0.0	–0.2	–0.3
Trade services	1.1	2.7	0.2	0.0	–0.0	–0.1
Transport&Communication	–0.4	1.4	0.0	0.2	0.2	0.1
Financial Services	–0.0	1.5	–0.2	0.0	–0.0	–0.1
Other Services	0.7	1.7	0.3	–0.0	0.0	0.0

Source: Worldscan

4.2 Accession to the internal market

We now explore the implications of accession to the internal market by simulating a gradual abolishment of the NTBs presented in table 3.3. Since NTBs are very similar to formal import tariffs, the channels through which NTBs affect the economies in WorldScan are also similar. Hence, the abolishment of NTBs changes relative prices, exerts trade creation and trade diversion, changes the terms-of-trade and affects the incentives to invest. There are, however, two major differences. First, in contrast to tariffs, NTBs do not generate revenues since they reflect real trade costs, e.g. waiting time at borders or the time devoted to customs formalities. Indeed, NTB's are modelled as some kind of iceberg cost, the idea being that a share of the commodities melts away during the phase of trade. As the abolishment of NTBs thus entails a reduction in real trade costs, removing it will not imply a terms-of-trade loss but a terms-of-trade gain. More specifically, a bilateral reduction of NTBs can cause a terms-of-trade gain in both

countries! To see this, note that we measure the terms of trade as the price of exports relative to imports that holds just outside the domestic border. For imports, the price includes cost of freight (the iceberg costs and the c.i.f - inclusive of cost, insurance and freight - that are present in the database) but not import taxes. For exports the price is f.o.b (free on board) and includes export taxes but excludes the iceberg costs. Lower NTBs can thus raise the price of exports relative to imports in both countries.

The second difference between import tariffs and the NTBs is that they are symmetric between the EU and the CEECs. Hence, abolishing the iceberg tariffs implies that each sector experiences two shocks: fiercer competition on the home market as the relative price of foreign varieties falls, and a better competitive position on the foreign market.

Macroeconomic effects

The macroeconomic effects of accession to the internal market are presented in Table 4.3. It reveals that the CEECs experience a terms-of-trade gain of 6.7% without of a terms-of-trade loss in the EU countries. In particualr, the EU experience a terms-of-trade gain of 0.6%. The different magnitude in the terms-of-trade effect among the EU and the CEECs is due to the large trade share of the CEECs with the EU as compared to the EU's trade share with the CEECs.

The macroeconomic implications of accession to the internal market are substantial for the CEECs. On average, GDP and consumption increase by 5.3% and 9.3%, respectively. The increase in GDP for Hungary is 9% while GDP in Poland and CEEC5 increases by 5.8% and 3.4%. For all countries, consumption growth is higher than the growth in GDP because of the terms-of-trade gain. For Hungary, the extra consumption growth due to accession to the internal market is almost 1% annually (between 2004 and 2020). For CEEC5, the increase is 0.5% per year (calculated, for comparability, between 2004 and 2020).

The macro-economic effects are the result of three mechanisms. First, changes in the relative prices imply that countries can better exploit their comparative advantages. This increases production efficiency and welfare. The efficiency gain induces more capital accumulation and an increase in production. Second, the terms-of-trade gain raises welfare as the consumption volume can increase *ceteris paribus*. Third, the terms-of-trade gain as such raises the price of output relative to the cost of capital. Consequently, it raises the rate of return to investment in the CEECs. This contributes to capital formation and increases production. These dynamic efficiency gains are important for the macroeconomic impact.

The effects of accession to the internal market (in table 4.3) are substantially larger than for the customs union (in table 4.1) and for the Europe agreements (in appendix D). Indeed, the GDP-effects for the CEECs are about twice the size of the effects of the Europe agreements. Measured in consumption levels, the difference is even more pronounced. The main reason for this large effect is that the shock derived in section 3.2 is large compared to the formal barriers to trade. Furthermore, accession to the internal market refers to a reduction in real trade costs

whereas formal trade barriers reflect distortions in relative prices accompanied by public revenues (that are recycled to the private sector).

Our results for the economic implications of accession to the internal market are also larger than previous studies have reported (see e.g. Baldwin et al., 1997; Brown et al., 1997; Breuss, 2001). These studies simulated a uniform 5% or 10% reduction in trade costs to explore the impact of accession to the internal market. Such a shock is no more than an eye-ball view on accession to the internal market, however. In contrast, our approach is based on the empirical findings of 16 gravity estimations. The results suggest that the shock of accession to the internal market is more than a small reduction in trade costs. Another reason why we find large effects of accession to the internal market is due to the dynamic effects of increased capital accumulation. Indeed, a major part of the GDP increases is due to additional investment associated with a higher return to capital and the lower producer cost of investment goods. These dynamic efficiency gains are not always fully captured in some of the previous studies.

Still, our methodology can be subject to debate. This holds for the interpretation of the EU dummies in our estimations, the way in which we translate them into potential trade increases, and the implementation of the corresponding NTBs in Worldscan. Section 5 will therefore perform a of sensitivity analysis with respect to the main assumptions.

Table 4.3 Macroeconomic effects of accession to the internal market

	volume of GDP (%)	volume of consumption (%)	terms of trade (%)
CEEC7	5.3	9.3	6.7
- Hungary	9.0	13.8	7.1
- Poland	5.8	9.0	6.9
- CEEC5	3.4	8.2	6.7
EU15	0.1	0.2	0.6
- Germany	0.1	0.4	1.2
- France	0.1	0.1	0.3
- United Kingdom	0.0	0.1	0.3
- Netherlands	0.1	0.4	0.5
- South Europe	0.1	0.2	0.7
- Rest EU	0.1	0.3	0.6
Third countries	0.0	0.0	0.0
- Rest OECD	0.0	0.0	0.0
- Former Sovjet Union	0.0	0.0	0.1
- ROW	0.0	0.0	0.0

Source: Worldscan

The effects on consumption and GDP differ substantially among the three CEEC blocks. In particular, the effects for Hungary are much larger than for Poland and CEEC5. The reason for this is twofold. First, the trade shock for Hungary is relatively large as we saw in table 3.4. Indeed, Hungary appears to have a comparative advantage in those sectors that experience the

largest decline in NTBs. Second, Hungary is a relatively open economy so that a larger share of its GDP is affected by the removal of NTBs.

The macroeconomic effects for the EU countries are relatively small. The magnitude of these effects, however, differs among EU members and depends on the respective comparative advantages relative to the CEECs. In general, EU GDP rises by less then 0.1%. Among the EU countries, Germany and the Netherlands experience the largest gains. Third countries suffer marginally from trade diversion. In particular, these countries specialize their exports in similar sectors as the CEECs do, namely labour-intensive products such as textiles.

Sectoral effects

To understand the sectoral effects of enlargement of the internal market, we refer to two shocks in each sector. First, an industry where an NTB is abolished faces fiercer competition on the home market as the relative price of varieties from the EU falls relative to domestic varieties. This causes a shift in consumer demand away from domestic varieties, leading to a higher import intensity. The drop in demand for domestically-produced commodities lowers the producer price which causes a shift in resources away from the sector where the NTB is abolished. The lower producer price also exerts an upward effect on the export intensity.

The second shock of the removal of NTB's is that the EU lowers its tariffs. This reduces the relative consumer price of CEEC varieties in the EU, causing a higher demand for these varieties. This exerts an upward effect on the CEEC producer price which attracts resources to this sector.

Via various linkages of consumption demand, investment demand and intermediate input demand, the two channels just described can exert an impact on the entire sectoral structure of the CEEC economies. On balance, a sector is likely to expand if an NTB is abolished and if that sector exports a large share of its production towards the EU. If a sector produces primarily for the home market, however, cheaper varieties from the EU may render the impact on production in that sector negative.

In addition to the two demand effects above, the removal of NTB's also exerts a supply effect. This is because the reduction in real trade costs changes input prices for two reasons. First, lower real trade costs reduce the price of intermediate inputs so that production cost fall. Second, via Stolper-Samuelson factor price effects, production cost might change further.

How all these forces work out in the model depends on the details of input-output structure, comparative advantages, trade intensity of sectors, etc. The model consistently links these aspects and can thus tell us how the various channels ultimately affect the output structure. The results are presented in table 4.4.

In general, table 4.4 reveals that the production share in most services sectors falls in the CEECs relative to food processing and textiles. Also production in electronic equipment and transport equipment increases substantially in the CEECs. These increases in the production of

these sectors come at the expense of other sectors, such as energy-intensive products, raw materials and fabricated metal products. Below, we discuss the sectoral production effects in more detail.

Table 4.4 reveals that the reduction in bilateral trade costs of 15% raises the production of textiles substantially in all CEECs. This is mainly because of the strong export orientation of this sector. To illustrate, Hungarian exports amount to roughly 70% of total textile production.[11] Hence, the effect of increased access to the EU market dominates the effect of cheaper EU products on the Hungarian market.

In agriculture, output growth is only marginal in the CEECs. As a share in total value added, the agricultural sector even shrinks. The explanation is that the EU gains access to the CEECs' markets, while in the CEECs, the agricultural sector largely produces for the home market (the initial export ratios for Poland and CEEC5 are less than 5%; for Hungary the ratio is around 15%). The food processing sector is similar in structure to the agriculture sector, although somewhat more export oriented. Also similar to agriculture is that the removal of the NTB in food processing implies a substantial reduction in trade costs. In contrast to the agricultural sector, however, this exerts a strong growth in the production of food processing. The reason for the difference in effects with agriculture is that the price of the food processing sector's most important intermediate input, namely agricultural goods, falls substantially.

The bilateral real trade cost in the sectors machinery and equipment, electronic equipment and transport equipment fall. This causes a substantial production increase in these sectors in Hungary, especially because these sectors are export intensive (the export share in Hungary ranges from 70% to 85% of production). Since the export shares of these industries in Poland are much smaller (the shares range from 22% to 32%), the production increases in that country are also smaller. In machinery and equipment, production in Poland even contracts. The same holds true for the CEEC5.

In the service sectors, we observe small production increases. In terms of total value added, however, the shares of these four industries shrink. The reason is that real trade costs do not fall in two of the service sectors (transport&communication and financial services), while sectors where they do fall are largely non-tradable. For instance, the sector trade services includes the retail sector while other services includes, among others, construction. These sectors feature low export shares. The impact on these sectors is therefore determined by the input-output links and the relative profitability of these sectors compared to agricultural and manufacturing sectors. Since most tradable sectors gain in importance, we observe a shift in value-added away from the service sectors. Since GDP increases in aggregate terms, however, these sectors nevertheless grow in terms of output.

[11] The baseline *data* refer to data from the initial calibration. Compared to this initial calibration, the simulations of the Europe agreements and the customs union have changed these trade intensities. The effects presented in this section are relative to a path in which the customs union is already implemented.

In many EU countries, we observe a sectoral pattern that is opposite from that of the CEECs. Indeed, food processing, electronic equipment and transport equipment typically shrink in the EU. Textiles fall in Southern Europe and France (not reported in the table), but not in Germany and the Netherlands. The expansion in Germany, The Netherlands and Southern EU countries in machinery and equipment is due to increased investment demand from the CEECs. In the Netherlands, agricultural production and the production in transport and communication increases while production in food processing and electronic equipment falls.

So far we have not paid much attention to changes in factor markets. It is however worth noting that the CEECs' reallocation of production to the tradeable (and unskilled-intensive) sectors causes the relative wage of unskilled labour to rise in all CEECs. As a consequence production becomes increasingly skilled intensive in these countries. The production also becomes more capital intensive as the relative price of investment goods falls.

Table 4.4 Sectoral effects (relative changes in production) of accession to the internal market

	Hungary	Poland	CEEC5	Germany	Netherlands	South EU
Agriculture	2.7	0.6	0.9	–0.4	3.5	–0.4
Raw materials	–10.8	–8.9	–5.6	0.2	0.2	0.3
Food Processing	34.8	34.0	10.1	–2.6	–1.7	–0.7
Textiles and Leather	34.0	47.0	52.1	3.7	2.0	–2.2
Non-metalic Minerals	–2.3	–6.6	4.0	–0.4	–1.0	0.4
Energy-intensive products	–5.4	-4.0	–2.6	0.6	0.4	0.4
Other manufacturing	7.1	–2.9	–6.8	0.8	0.1	0.5
Metals	2.6	–11.7	–5.5	0.9	0.8	0.9
Fabricated Metal Products	–2.3	–3.3	0.3	0.3	–0.2	0.5
Machinery and Equipment	22.9	–4.5	–1.0	1.0	0.6	0.9
Electronic Equipment	70.3	27.5	8.4	–0.3	–0.9	–0.5
Transport Equipment	68.2	29.3	42.9	–0.4	–0.7	–1.1
Trade services	7.8	7.2	2.8	0.1	0.1	0.2
Transport&Communication	2.1	0.7	–4.5	0.5	0.6	0.5
Financial Services	1.7	0.3	–0.5	0.2	0.2	0.1
Other Services	6.1	4.0	1.9	0.2	0.1	0.1

Source: Worldscan

4.3 Free movement of labour

We now explore the economic implications of the migration shock presented in table 3.5. Thereby, we assume that the composition of migrants between high-skilled and low-skilled workers is equal to the composition of workers in the EU. Section 5 performs a sensitivity assumption with respect to this assumption. Table 4.5 shows the economic implications of the migration shock.

Table 4.5 reveals that GDP per capita rises in the CEECs due to the reduced supply of labour. The reason is that capital is not perfectly mobile across countries. Hence, the lower supply of labour increases the capital/labour ratio in these countries. This raises the marginal product of labour and thereby raises wages. For similar reasons, GDP per capita in Germany and the Rest of the EU decrease. Indeed, the lower capital/labour ratio causes a decline in the productivity of labour in these countries and thus a fall in wages. The effect remains small, however, because of the modest increase in the population size. In other EU countries, immigration has a negligible impact on per capita income because the small number of immigrants. The effect on the relative wages is negligible in all countries because we assume that the composition of migrants is identical to that of the destination country.

The total volume of GDP drops in all CEECs by about 1.8% because of the outflow of labour. In Germany it increases by 1.5%. GDP in the other EU countries rises only slightly. The effects on consumption are smaller than those on GDP. This is because of changes in the terms-of-trade. In particular, lower wages in Germany and the Rest of the EU exert a downward pressure on producer prices. The opposite holds for the accession countries. This renders the terms of trade effect positive for the CEECs and negative for the EU countries with a positive effect on consumption in the CEECs and a negative effect in the EU.

Table 4.5 Economic effects of migration

	population	wage ratio low/high	GDP per capita	volume of GDP (%)	volume of consumption (%)	terms of trade (%)
CEEC7				–1.8	–1.3	0.3
- Hungary	–2.1	0.0	0.8	–1.3	–1.0	0.2
- Poland	–1.9	0.0	0.6	–1.4	–1.1	0.3
- CEEC5	–3.4	0.1	1.1	–2.3	–1.8	0.4
EU15				0.6	0.5	–0.1
- Germany	2.0	0.0	–0.4	1.5	1.3	–0.2
- France	0.1	0.0	0.0	0.1	0.1	0.0
- United Kingdom	0.2	0.0	0.0	0.1	0.1	0.0
- Netherlands	0.2	0.0	0.0	0.1	0.1	0.0
- South Europe	0.2	0.0	0.0	0.1	0.1	0.0
- Rest EU	1.2	0.0	–0.2	0.9	0.8	–0.1
Third countries				0.0	0.0	0.0
- Rest OECD	0.0	0.0	0.0	0.0	0.0	0.0
- Former Sovjet Union	0.0	0.0	0.0	0.0	0.0	0.0
- ROW	0.0	0.0	0.0	0.0	0.0	0.0

Source: Worldscan

The small effects of migration on GDP per capita are consistent with empirical evidence on the wage effects of immigration. In particular, Bauer and Zimmermann (2000) present a survey of

the literature and conclude that immigrants have only a negligible negative impact on native wages.

5 Sensitivity analysis

This section performs sensitivity analysis to some of the findings of the previous section. In particular, some assumptions in section 3.2 on the internal market can be subject to debate and thus require further elaboration. Indeed, by exploring alternative assumptions, we are able to test the robustness of our results. Furthermore, by analysing the economic implications under extreme assumptions, this section gives us an impression of the range in which the impact of the accession to the internal market will fall. Apart from sensitivity analysis on the internal market simulation, we also explore alternative assumptions regarding the migration effect.

To keep the presentation in this section transparent, we do not report all outcomes in the same detail as before. Instead, we concentrate on the most relevant countries for our purpose (the CEECs, Germany, the Netherlands and Southern Europe) and the most sensitive sectors in the context of enlargement (agriculture, food processing and textiles).

5.1 No accession to the internal market for agriculture and food processing

In section 4.2, we stimulate a removal of NTBs for all industries for which we found a significant EU dummy (see section 3.2). It is uncertain, however, how EU policy regarding the agricultural and food sectors will be applied after the enlargement. One way to shed light on this is to assume a policy that somehow prevents free trade in the products from these sectors. Measures that maintain the current trade barriers -- initiated by either the EU or the accession countries -- might indeed be part of an agreement on the terms of accession to the EU. To get an impression of the implications of such an agreement, we simulate a removal of the NTBs in all sectors, except for agriculture and food processing. The effects are presented in the second part of table 5.1; the first part repeats the results from section 4.2.

The second part of table 5.1 reveals that the effects on the terms of trade are smaller than in section 4.2, i.e. where the NTBs in agriculture and food processing are also abolished. Also the effect on consumption somewhat smaller in the CEECs than before. For the EU-15, in contrast, the effects are comparable to section 4.2.

The sectoral effects for the CEECs differ to a large extend from those in section 4.2. Production in agriculture and food processing no longer increase but decrease in the CEECs. This is because the NTBs imposed by the EU are not abolished so that the CEECs do not get access to the EU market. The decline in the value-added of agriculture and food processing occurs because low-skilled labour in the CEECs moves from agriculture and food processing

towards expanding sectors, such as textiles, for which the EU market is opened. Indeed, the sectoral production effects in textiles are larger than in section 4.2.

Table 5.1 Sensitivity analysis of the internal market simulation

	volume of Consumption (%)	terms of trade (%)	Agriculture	Food Processing	Textiles and Leather
NTBs abolished (reference scenario)					
CEEC7	9.3	6.7			
Hungary	13.8	7.1	2.7	34.8	34.0
Poland	9.0	6.9	0.6	34.0	47.0
CEEC5	8.2	6.7	0.9	10.1	52.1
E15	0.2	0.6			
Germany	0.4	1.2	–0.4	–2.6	3.7
Netherlands	0.4	0.5	3.5	–1.7	2.0
South Europe	0.2	0.7	–0.4	–0.7	–2.2
NTB for agriculture and food not abolished					
CEEC7	7.0	5.3			
Hungary	10.6	5.3	–9.7	–7.6	42.7
Poland	6.1	5.0	–5.6	–5.3	56.2
CEEC5	6.6	5.6	–4.5	–4.6	52.4
E15	0.2	0.5			
Germany	0.3	1.0	0.3	0.8	3.1
Netherlands	0.3	0.4	0.4	0.7	1.9
South Europe	0.2	0.5	0.4	0.2	–2.8
NTB determined by point estimate					
CEEC7	9.7	7.0			
Hungary	14.3	7.3	2.7	35.1	34.5
Poland	9.3	7.1	0.6	34.1	47.3
CEEC5	8.6	7.0	1.0	10.1	52.5
E15	0.3	0.7			
Germany	0.4	1.2	–0.4	–2.6	3.7
Netherlands	0.4	0.5	3.5	–1.7	2.0
South Europe	0.2	0.7	–0.4	–0.7	–2.2
NTB modelled as tariffs					
CEEC7	3.9	0.7			
Hungary	6.6	1.2	6.1	41.4	50.0
Poland	3.8	0.3	3.4	40.8	62.1
CEEC5	3.0	1.1	3.2	12.8	67.3
E15	0.1	0.0			
Germany	0.1	0.1	–0.0	–2.5	6.1
Netherlands	0.1	0.1	4.6	–1.4	3.3
South Europe	0.0	–0.0	0.1	–0.7	–1.5

Source: Worldscan

5.2 Non-tariff barriers set at their point estimates

In section 4.2, we set the NTBs equal to zero if the coefficient of the EU dummy in table 3.3 is insignificant at the 5% confidence level. This cut-off point seems most natural, but may be somewhat abrupt. To analyse the sensitivity of our results to this assumption, we simulate an abolishment of NTBs as they are determined by their point estimate of the EU dummy in table 3.3. If we find a negative coefficient for the EU dummy in a sector, we have set it equal to zero because higher real trade cost due to accession to the internal market seems implausible. The tariff for energy-intensive goods, other manufacturing and transport and communication are set at 2%, 1% and 1% respectively. Given the size of these tariffs it is obvious that the results are not affected much. This is confirmed by the results reported in the third block of table 5.1.

5.3 Non-tariff barriers reflect tariffs

So far, we have assumed that the NTBs change relative prices of various goods, and involve real trade costs. Alternatively, one could model the NTBs as import tariffs, the revenues of which are recycled to the private sector in a lump-sum fashion. In our third sensitivity analysis, we explore this alternative modelling of the trade cost. In particular, we assume that the tariff equivalents of the NTBs are abolished and that the revenues are recycled to the private sector. This effectively eliminates the income effects associated with the removal of real trade costs. The results are given in the final block of table 5.1.

The results are qualitatively similar to the reference scenario. In quantitative terms, however, the results differ substantially. The most pressing differences concern the changes in the terms of trade. If a country specializes its exports in those sectors where the price increases are largest, it will experience a terms-of-trade gain. The results in table 4.3 suggest that the CEECs typically have a comparative advantage in sectors that are substantially affected by accession to the internal market, such as textiles, machinery and equipment and trade services. Also the Netherlands and Germany appear to have such comparative advantages so that EU enlargement exerts a terms-of-trade gain for them. Southern Europe experiences a marginal terms-of-trade loss.

The sectoral pattern differs somewhat due to a different macro-economic picture. As the tariff reduction does not involve an income effect but only a distortion in relative prices, the GDP and consumption effects are smaller. At a lower consumption level (as compared to the benchmark simulation) households feature a somewhat different consumption pattern since income elasticities are not equal to unity. In particular, at lower incomes, households demand a larger share of food and agricultural goods. This explains the more positive production growth in these sectors.

5.4 Migration of low-skilled labour

The final sensitivity analysis refers to the migration effects. Section 4.3 assumes that migrants from the CEECs have the same skill level as natives in the EU. It is indeed true that the skill level of workers in the CEECs is high in the perspective of their economic development, i.e. compared to countries at a similar level of GDP per capita. However, migrants from the CEECs will probably have relatively low skills as compared to natives in the EU. Moreover, because skills acquired in the CEECs are not always productive in the EU, immigrants may primarily end up in low-skilled jobs. To explore the sensitivity of our simulation to the skill composition of migrants, we run a simulation in which we assume that all immigrants from the CEECs are low-skilled. This extreme assumption is meant to explore the robustness of our assumption of the previous section. Table 5.2 reports the result of this alternative migration experiment.

Table 5.2 Economic effects of migration (low-skilled labour only)

	population	wage ratio low/high	GDP per capita	volume of GDP (%)	volume of consumption (%)	terms of trade (%)
CEEC7				–1.4	–1.0	0.3
- Hungary	–2.1	3.2	1.0	–1.1	–0.8	0.2
- Poland	–1.9	3.1	0.9	–1.1	–0.9	0.2
- CEEC5	–3.4	5.5	1.6	–1.9	–1.4	0.4
EU15				0.5	0.4	–0.1
- Germany	2.0	–3.0	–0.8	1.2	1.0	–0.2
- Netherlands	0.2	–0.2	0.0	0.1	0.1	0.0
- South Europe	0.2	–0.3	–0.1	0.1	0.1	0.0
- Rest EU	1.2	–1.8	–0.4	0.7	0.6	–0.1

Source: Worldscan

We observe that the outflow of low-skilled workers from the CEECs, raises the ratio of low/high skilled wages in this region. Indeed, low-skilled workers in the CEECs become scarcer relative to skilled workers so that wages tend to converge. The opposite holds for the EU countries where the inflow of low-skilled workers reduces the wage of low-skilled workers, relative to skilled workers. This observation is also found by a number of empirical studies. In particular, although the aggregate wage effect of migration tends to be small, low-skilled wages are often found to respond more strongly than high-skilled wages (see e.g. Bauer and Zimmermann, 1999).

The different skill level of migrants compared to the experiment in section 4.3 implies that the impact on GDP and consumption are also different, both in the CEECs and the EU. In particular, GDP per capita in the CEECs rises more substantially since the ratio of skilled/unskilled people increases. The opposite holds for the EU. To illustrate, GDP per capita in Germany falls by 0.8% if all immigrants are low skilled, while the decline is only 0.4% if migrants have the same skill level as natives. The decline in the aggregate volume of

consumption and production in the CEECs is, respectively, 0.3% and 0.4% smaller than in the previous section. In the EU, the effect on GDP falls from 0.6% to 0.5% and the effect on consumption falls from 0.5% to 0.4%. Hence, the skill composition does matter for the economic effects of immigration, although in macro-economic terms the differences are modest. The most important effects are probably related to the wage distribution: wage differentials in the EU will become larger to the extend that immigrants from the CEECs indeed occupy low-skilled jobs.

6 Conclusions

This paper explores the economic implications of enlargement of the EU with countries from Central and Eastern Europe. We consider three dimensions of enlargement: the move towards a customs union, the enlargement of the internal market, and free movement of labour. Overall, the economic implications for the accession countries tend to be significant. To illustrate, if we add the impact of the three shocks of enlargement for the CEECs, we find that GDP per capita increases by more than 8% in the long run. For Hungary, the effect even exceeds 12%. This is because the relatively open Hungarian economy benefits relatively much from the accession to the internal market. The effects for EU countries are generally positive but modest. For instance, Dutch GDP per capita rises by a mere 0.15% in the long run. For Germany, the economic effects tends to be dominated by migration, causing a slight reduction in GDP per capita.

The study suggests that, compared to the customs union and free movement of labour, accession to the internal market yields the largest economic effects. For instance, whereas the move towards a customs union and free movement of labour increase the volume of consumption per capita in the CEECs by, respectively, a little more than 2% and a little less than 1%, accession to the internal market raises consumption by more than 9% in the long run. Sensitivity analysis suggests that the magnitude of this effect is quite robust. Also for the EU, enlargement of the internal market yields an expansion of consumption of about 0.2%.

The effects reported in this study tend to be large compared to previous model simulations of EU enlargement. Indeed, most earlier studies report gains for the accession countries between 1.5 and 8 per cent. Our big effects originate in the relatively large effects of accession to the internal market. In particular, the empirical approach followed in this study, as opposed to the 'best-guess' approach followed by others, suggests that the accession to the internal market involves a bigger shock than is usually assumed.

We also find that the accession to the internal market yields disproportionate effects on particular industries. Indeed, industrial relocation will be required to reap the gains from trade and to exploit comparative advantages of countries. Therefore, some sectors will face a serious decline, such as energy-intensive products in the CEECs and textiles in the Southern part of the EU. In the CEECs, the sectors food processing and textiles are likely to expand most.

The effects in this study are surrounded by uncertainties. For instance, if industrial relocation would be mitigated by compensating measures, either by the EU or the CEECs, this would probably reduce the sectoral effects of enlargement. In that case, enlargement would also bring lower overall welfare gains to the accession countries and the EU. Moreover, other policies that have important economic implications, such as the future Common Agricultural Policy, the Structural Funds and the accession of the CEECs to the EMU, are not included in the analysis. These policies are, however, difficult to foresee. Our results may thus be interpreted as the potential gains from EU enlargement, which may be affected either positively or negatively by various other policy responses in the EU and the CEECs.

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Appendix A Regional and sectoral concordances for WorldScan

Table A.1

1	Hungary	
2	Poland	
3	Rest CEEC	
4	Former Soviet Union	
5	Germany	
6	France	
7	United Kingdom	
8	Netherlands	
9	South Europe	Spain, Portugal, Italy, Greece
10	Rest EU	Sweden, Denmark, Finland, Ireland, Austria, Belgium (+Luxembourg)
11	Rest OECD	United States, Japan, Australia, New Zealand, Canada, Iceland&Norway, Switzerland
12	Rest World	Turkey, Rest of Middle East, Morocco, Rest of North Africa, South African Customs Union, Rest of Southern Africa, Rest of Sub-Saharan Africa, Central America and Carribean, Mexico, Argentina, Brazil, Chile, Uruguay, Venezuela, Colombia, Rest of South America

Table A.2

1	Agriculture	Paddy rice, Wheat, Grains, Cereal Grains, Non grain crops, Vegetables, Oil seeds, Sugar cane Plant-based fibres, Crops, Bovine cattle, Animal products, Raw milk,, Wool, Forestry, Fisheries,
2	Raw materials	Oil, Gas, Coal, Minerals
3	Food Processing	Processed rice, Meat products, Vegetable Oils, Dairy products, Sugar, Other food products, Beverages and tobacco
4	Textiles	Textile, Wearing Apparel, Leather products
5	Nonmetallic Minerals	
6	Energy-intensive Goods	Chemicals, Rubbers and Plastics. Petrol and coal refinery
7	Other Manufacturing	Other Manufacturing, Lumber and Wood, Paper, prin and publishing
8	Metals	Nonferrous Minerals, Ferrous Minerals
9	Fabricated Metal Products	
10	Machinery and Equipment	
11	Electronic Equipment	
12	Transport	Other Transport Industries, Motor Vehicles and parts
13	Trade services	
14	Transport and communication	Other, sea and air transport, communication
15	Financial services	Insurance, Other Financial services
16	Other services	construction, other business services, electricity, gas manufacturing and distribution, water, recreational services, government services

Appendix B Estimating the gravity equation, data and robustness

Data

The estimation results presented in Section 3.2 make use of three data sets. The first is the GTAP 5 database for the economic variables as bilateral exports, national income, industry production and tariffs. Second, to proxy trade cost we use distance data. We use the great circle distance between capital cities. Third, we use population data from the UN.

The countries we distinguish in the sample are: Hungary, Poland, rest CEEC, Russia, Germany, France, United Kingdom, Netherlands, Austria, Denmark, Finland, Greece, Ireland, Italy, Portugal, Spain, Sweden, Belgium, Luxembourg, Switzerland, rest EFTA, Canada, USA, Japan, Australia, New Zealand and rest of the World.

Due to the fact that some of the countries in the sample are not actual countries but combinations of countries (rest CEEC s, rest EFTA and rest World) we made some ad hoc choices for the distance variable. For the capital of rest CEEC we used the capital of Czechoslovakia, for rest EFTA the capital of Norway and for the rest of the world the capital of Kenya. Admittedly, these choices are blunt, therefore we explicitly check the robustness of our results for the inclusion of the rest of the World (which is more than changing the capital). Different choices for the other two ad hoc choices turned out to be harmless. Finally, our distance data do not distinguish between Luxembourg and Belgium. We therefore assumed distances between their capitals and other capitals identical. We only adjusted the distance between the capital of Luxembourg and Belgium (source: WWW.ANWB.NL).

In tables B.1 and B.2, we report the estimates of:

$$X_{ijs} = \alpha_s + \beta_{1s} D_{ijs}^{EU} + \beta_{2s} d_{ij} + \gamma_{1s} Y_i + \gamma_{2s} y_i + \gamma_{3s} Y_j + \gamma_{4s} y_j + \sum_d \delta_{ds} D_d + \nu_{1S} T_{ijs}^M + \nu_{2S} T_{ijs}^E + \varepsilon_{ijs} \quad , \qquad (0)$$

where all real variables are defined in logs. X_{ijs} stands for exports from country i to j in industry s, $Y(y)$ is the GDP (per capita) of the exporting and importing countries, d stands for the distance between the capitals of countries i and j, D_d is a set of dummies, and D^{EU} is a dummy that equals unity if i and j are currently members of the EU and else zero. The variable T_{ijs}^{M} is the import tariff levied by country j on country i exports and T_{ijs}^{E} is the export tariff levied by country i on to country j.[12]

An asterisk indicates significance at a 5% confidence interval. Before turning to the EU-dummies, we take a closer look at the other parameters. The distance variable is negative and significant in all industries. The size of the estimated coefficient is, however, notably lower for service sectors. This indicates that, if the service sector's products are tradeable, distance matter less; a result that is intuitively clear once one thinks about financial services for example.

[12] As many tariff rates are zero we use: $T_{ijs}^M \equiv \log(1 + t_{ijs}^M)$.

Table B.1 Estimations Results (to be continued)

	Distance	Export levies	Import tax	Exporter income	Exporter income pc	Importer income	Importer income pc
Agriculture	–0.65[a]	4.95[a]	1.46[a]	0.88[a]	–0.58[a]	0.95[a]	–0.30[a]
Raw Materials	–0.68[a]	–38.32[a]	–10.64	1.10[a]	–0.84[a]	0.92[a]	–0.26[a]
Food Processing	–0.59[a]	1.33	0.06	0.67[a]	0.00	0.94[a]	–0.28[a]
Textiles and Leather	–0.79[a]	3.79	–1.68	0.86[a]	–0.56[a]	0.86[a]	–0.27[a]
Non metallic Minerals	–0.96[a]	–7.84[a]	6.83[a]	0.92[a]	–0.06	0.92[a]	–0.02
Energy-intensive Products	–0.84[a]	–8.62[a]	–3.73[a]	0.88[a]	0.08[a]	0.86[a]	–0.29[a]
Other Manufacturing	–0.86[a]	–28.05[a]	–2.96	0.91[a]	0.04	0.91[a]	–0.10
Metals	–1.25[a]	–10.21	–1.78	0.97[a]	–0.18[a]	1.07[a]	–0.03
Fabricated Metal Products	–0.99[a]	–28.04[a]	7.30[a]	0.96[a]	0.13[a]	0.88[a]	0.08
Machinery and Equipment	–0.82[a]	–25.14[a]	5.08[a]	0.97[a]	0.44[a]	0.86[a]	–0.05
Electronic Equipment	–0.86[a]	–15.93	1.36	1.12[a]	0.36[a]	0.92[a]	–0.14
Transport Equipment	–0.93[a]	8.70	5.91[a]	1.17[a]	0.25[a]	0.96[a]	0.14
Trade Sevices	–0.13[a]	14.51[a]	–0.59	0.83[a]	–0.10[a]	0.83[a]	–0.08[a]
Transport and Communication	–0.05[a]	46.48[a]	11.06	0.83[a]	0.00	0.91[a]	0.14[a]
Financial Services	–0.24[a]	–38.72[a]	–36.76[a]	0.86[a]	–0.13[a]	0.86[a]	–0.19[a]
Other Services	–0.23[a]	–12.55[a]	5.79	0.84[a]	–0.03	0.80[a]	–0.06

An [a] indicates significance at a 5% confidence interval. Standard errors are not provided in order to save space (these are available upon request).

Table B.1 Estimations Results

	Dummy EU	Dummy Adjacency	Constant	R-square	Potential trade increase %
Agriculture	1.25[a]	1.02[a]	–13.93[a]	0.67	249
Raw Materials	–0.10	1.05[a]	–16.14[a]	0.51	0
Food Processing	0.66[a]	0.85[a]	–9.04[a]	0.70	94
Textiles and Leather	0.85[a]	0.59[a]	–10.44[a]	0.77	134
Non metallic Minerals	0.73[a]	0.87[a]	–8.01[a]	0.82	107
Energy-intensive Products	0.13	0.71[a]	–6.28[a]	0.82	0
Other Manufacturing	0.08	0.80[a]	–6.73[a]	0.78	0
Metals	–0.10	0.67[a]	–6.16[a]	0.70	0
Fabricated Metal Products	0.44[a]	1.00[a]	–6.41[a]	0.82	56
Machinery and Equipment	0.31[a]	0.70[a]	–4.70[a]	0.80	37
Electronic Equipment	0.58[a]	0.08	–7.31[a]	0.69	79
Transport Equipment	0.66[a]	0.61[a]	–6.82[a]	0.75	94
Trade Services	0.76[a]	–0.16	–13.16[a]	0.83	113
Transport and Communication	0.03	0.00	–11.56[a]	0.93	0
Financial Services	–0.14	–0.28	–13.55[a]	0.77	0
Other Services	0.27[a]	0.07	–10.04[a]	0.88	31

An [a] indicates significance at a 5% confidence interval. Standard errors are not provided in order to save space (these are available upon request).

Export levies do seem to reduce exports. That import taxes are only significantly negative in Raw Materials and Financial Services can possibly be explained by the intuition that import tariffs are a response to "excessively" high imports. But this it is not possible to test for this explanation. The exporter and importer income coefficients are estimated precisely and are all positive. Eyeballing at these coefficients for a moment learns that all but four are less than unity, a common finding in the literature. This implies that trade rises less than proportionally with size. Or, saying the same thing in a more familiar way: small countries tend to be more open. The export's per capita income term relates to the capital intensity of production. Without wanting to dwell or these results, some high-tech sectors (e.g. Electronic Equipment, Machinery and Equipment) do appear with a positive and significant sign, whereas the labour-intensive service industries (Textiles and Leather; Trade Services) have negative signs. Hence, rich countries are more likely high-tech producers. The negative signs for importer per capita income in all but three industries are slightly puzzling, as these indicate that the Fabricated Metals, Transport Equipment and Transport and Communication sector produce the only luxuries in the 'imported' consumption basket. The adjacency dummy is significant and positive for all non-service sectors except for Electronic Equipment. This indicates that sharing a common border lowers trade costs.

Robustness

Table B.3 presents the results for three additional specifications. To save space, we only show the EU- dummies for the different specifications (the results are available upon request from the authors). The first column repeats the results from the main text. In the second column we leave out the rest of the world and hence estimate the equation for 26 countries. The qualitative results are analogously

In the third column we remove the formal bilateral trade barriers as independent variables. Comparing these again with the first column reveals again that the qualitative differences are minor. Only the dummy for Energy-intensive Products turns significant. If import barriers are the most important relative to export subsidies (an assumption that is not valid for Agriculture and Food Processing), one would expect the dummies in column (III) to be larger than those in column (I). This is only confirmed for half of the sectors. We conclude from the minor differences between column (I) and (III) that Single Market accession is indeed something that goes beyond reducing formal tariff barriers.

In the last column we report on an estimation we here we replaced the exporter's GDP by the exporting sector's value added. This is motivated by the notion that the exporter's sectoral value added is likely a superior proxy for the country's supply potential. Industries where specific factors are important (think of industries that rely on natural resources as Agriculture and Raw Materials and the like) are expected to show a much better fit. Though not depicted in the table, it is indeed Raw Materials that show the largest improvement in the fit. Three

industries show a decline where Financial Services is most notable. Turning to the estimated dummies, it is Raw Materials, Metals and Transport and Communication that draw attention. The dummies in these industries turn significant and positive. What is intuition for this result? Once we properly control for supply (possibilities) intra-EU trade exceeds the 'normal' level.

Table B.3 Robustness Analysis. EU Dummies from 4 specifications

	Main Text	Without RWO	Excluding Tariffs	Export industry value added
	(I)	(II)	(III)	(IV)
Agriculture	1.25	1.09	1.01	1.01
	6.94	5.85	6.64	5.77
Raw Materials	–0.10	–0.26	0.00	0.84
	0.45	1.15	0.01	4.62
Food Processing	0.66	0.43	0.71	0.75
	3.80	2.45	5.86	4.41
Textiles and Leather	0.85	0.83	0.95	0.61
	6.62	6.58	8.64	5.21
Non metallic Minerals	0.73	0.71	0.53	0.52
	6.31	6.11	5.19	4.72
Energy-intensive Products	0.13	0.06	0.26	0.06
	1.31	0.57	2.71	0.60
Other Manufacturing	0.08	0.07	0.19	0.02
	0.71	0.60	1.75	0.15
Metals	–0.10	–0.15	–0.05	0.56
	0.62	0.92	0.30	3.51
Fabricated Metal Products	0.44	0.39	0.26	0.30
	4.01	3.71	2.58	2.81
Machinery and Equipment	0.31	0.28	0.21	0.50
	2.65	2.43	2.08	4.59
Electronic Equipment	0.58	0.61	0.55	0.28
	3.43	3.87	3.62	2.03
Transport Equipment	0.66	0.61	0.42	0.96
	4.32	3.93	2.96	6.30
Trade Sevices	0.76	0.69	0.77	0.80
	9.59	9.00	9.70	10.33
Transport and Communication	0.03	0.02	0.04	0.18
	0.52	0.35	0.75	3.50
Financial Services	–0.14	–0.15	–0.12	–0.15
	1.40	1.46	1.19	1.23
Other Services	0.27	0.22	0.27	0.24
	4.19	3.44	4.13	3.69

t-statistics are reported below the parameter estimates

We prefer the main-text specification as it is simple, analogous to the macro literature and derived from theory, see Bergstrand (1989).

Appendix C Calibration of non-tariff barriers in WorldScan

We take three steps to translate the estimated potential trade volumes into non-tariff barriers. The first step is the 'standard' procedure in the calibration, which gives parameters indicated by a superscript C1. In particular, for each industry the Armington demand system yields (we drop the industry subscript):

$$x_{ij}^{D} = s_{ij}^{C1} X_j^{D} \left(\frac{(1 + t^{D}) \bar{p}_{ij}}{P_j} \right)^{-\varepsilon} \tag{C.1}$$

where x is the trade from country i to country j and X is total demand for the good produced by the industry. Preferences are given by s. Prices (p) are treated as exogenous (indicated by a bar) in the equation because these are determined elsewhere in the calibration procedure. The price-index P is a function of the (given) prices. Formal tariffs are denoted as t. Superscript D indicates that a parameter is derived from the data. In calibrating the model, the preference parameter is determined such that the model replicates the bilateral trade data.

In a second step (denoted by superscript C2), we calculate the preferences required to produce the *cet. par.* trade volume predicted by the gravity model:

$$\Delta x_{ij}^{D} = s_{ij}^{C2} X_j^{D} \left(\frac{(1 + t^{D}) \bar{p}_{ij}}{P_j} \right)^{-\varepsilon} \tag{C.2}$$

where $\Delta \equiv e^{D^{EU}}$ denotes the potential trade increase. X_j is calculated such that it is consistent with the alternative bilateral trade flows. This gives us a set of alternative preference parameters s^{C2}, that are consistent with the potential trade flows that would materialise if there where no NTB's.

In the third step, we use the alternative preference parameter (C2) to calculate the NTB's. In particular, we re-calibrate the model so as to replicate the actual trade data again. For this, we adjust the prices in the Armington demand system by introducing a $\tilde{t}$ (indicated by superscript C3) that denotes the NTB, reflecting an iceberg cost:

$$x_{ij}^{D} = s_{ij}^{C2} X_j^{D} \left(\frac{(1 + t^{D}) \bar{p}_{ij}}{(1 - \tilde{t}^{C4}) P_j^{C3}} \right)^{-\varepsilon} \tag{C.3}$$

To determine the price index in the third calibration step, we use the fact that the NTB is zero for the consumption of domestic goods, i.e.:

$$x_{jj}^{D} = s_{jj}^{C2} X_j^{D} \left(\frac{(1 + t^{D}) \bar{p}_{jj}}{P_j^{C3}} \right)^{-\varepsilon} \qquad \text{(C.4)}$$

Expression (C.4) is used to pin down nominal prices. To be more precise, equations (C.3) and (C.4) are solved simultaneously to determine prices.

Appendix D Macroeconomic effects of the Europe agreements

In 1997, the accession countries imposed import tariffs on imports from the EU and vice versa. These tariffs are presented in table D.1. In accordance with the Europe agreements, these tariffs will have to be abolished in 2002.

Table D.1 Bilateral import tariffs in manufacturing between the CEECs and the EU in 1997

	Hungary	EU on Hungary	Poland	EU on Poland	CEEC5	EU on CEEC5
Textiles and Leather	10.4	10.6	15.2	12.2	14.2	11.2
Non-metalic Minerals	8.0	6.0	11.6	6.3	10.6	6.7
Energy-intensive products	7.4	6.5	11.3	6.4	8.3	6.3
Other manufacturing	7.5	4.1	11.5	3.2	10.8	3.6
Metals	5.1	5.5	15.9	2.6	7.1	4.1
Fabricated Metal Products	8.8	4.5	14.3	3.8	9.9	3.9
Machinery and Equipment	8.7	3.1	11.3	3.4	7.5	3.1
Electronic Equipment	8.3	5.6	13.3	11.4	5.2	5.6
Transport Equipment	13.3	5.4	18.8	8.7	15.2	8.0

Source: Purdue (2001)

Table D.2 presents the macro-economic effects of abolishing the import tariffs presented in table D.1 according to Worldscan. These results may serve as a benchmark to compare the outcomes of the three experiments in the main text.

Table D.2 Macroeconomic effects of the Europe agreements

	volume of GDP (%)	volume of consumption (%)	terms of trade (%)
CEEC7	2.6	0.1	–1.4
- Hungary	5.6	2.2	–1.0
- Poland	2.3	–0.9	–2.7
- CEEC5	1.9	0.5	–0.6
EU15	0.1	0.1	0.1
- Germany	0.1	0.1	0.3
- France	0.2	0.2	0.1
- United Kingdom	0.0	0.0	0.0
- Netherlands	0.1	0.1	0.0
- South Europe	0.1	0.1	0.1
- Rest EU	0.1	0.1	0.1
Third countries	0.0	0.0	0.0
- Rest OECD	0.0	0.0	–0.1
- Former Sovjet Union	0.1	0.1	0.1
- ROW	0.0	0.0	0.1

Source: Worldscan

Table D.2 reveals that the removal of import tariffs exerts a terms-of-trade loss for the accession countries and a terms-of-trade gain for the EU. Poland experiences the largest decline in the terms of trade as it imposed the highest tariffs in 1997. The associated welfare loss is reflected in a decline in the volume of Polish consumption. At the same time, the lower prices of imported goods, including investment goods, raises output in the CEECs. Overall, the volume of GDP in the CEEC7 expands by 2.6% while in the EU, it rises by 0.1%.

Abstract

This paper explores the economic consequences of the enlargement of the European Union with countries from Central and Eastern Europe. We focus on integration aspects that go beyond the reduction of formal trade barriers, namely accession to the internal market and free movement of labour. The economic implications for sixteen industries in several European countries are assessed by using WorldScan, a CGE model for the world economy. The results suggest that the candidate member states will gain substantially from accession to the internal market, although some sectors in these countries will shrink. Most EU countries will experience small welfare increases. We also find that the internal market effects are large compared to the economic effects of removing formal trade barriers and migration.